# WATER QUALITY

#### **Beneficial Use Attainment**

The Sac River basin has 173 miles of streams classified as supporting whole body contact recreation (MDNR 1986). McDaniel Lake, Fellows Lake, and Fulbright Spring Branch are the only waters designated for drinking water supply in the Sac River basin (8 miles total) (MDNR 1986). Water quality problems for the Sac River basin noted in 1994 by the MDNR were suspended solids in Stockton Branch originating from the town of Stockton (two miles of affected stream) and nutrient pollution of McDaniel and Fellows lakes from urban/agricultural sources. Another area of concern was potential groundwater contamination from various sources (faulty septic tanks, leaking storage tanks, agricultural runoff, etc.) in the area around Springfield (MDNR 1996).

All streams and lakes in the Sac River basin are classified for aquatic life protection and livestock/wildlife watering. McDaniel Lake is classified for drinking water supply as well as aquatic life protection and livestock/wildlife watering. In addition to these previously mentioned uses, Stockton Lake includes whole body contact and boating and canoeing as designated uses. Chesapeake Creek from its mouth upstream for 3 miles and 14 miles of Turnback Creek (T30N, R26W, section 35 to T28N, R25W, section 24) are classified for cold water fisheries. Cedar Creek from its mouth upstream for 27 miles is classified for whole body contact, boating, and canoeing. Brush Creek from its mouth upstream 13 miles is classified for whole body contact and cool water fishery. The lower 24.5 miles of Horse Creek have irrigation as an approved designated use. The Little Sac River from McDaniel Lake Dam to its mouth (lower 29 miles) is classified for whole body contact, boating and canoeing, and cool water fishery. The Sac River from Stockton Lake Dam downstream for 40 miles is classified for whole body contact, boating and canoeing, and irrigation. The Sac River from Stockton Lake upstream for 32.5 miles is also classified for these uses. Turnback Creek is classified for whole body contact from its mouth upstream for 33.5 miles and for boating and canoeing in the lower 14 miles.

Section 305(b) of the Clean Water Act requires states to report on the status of water quality in their surface waters. The MDNR summarizes the quality of Missouri waters every two years in these reports. Significant improvements have been made over the past quarter century in controlling pollution from sanitary wastes, such as that from cities, but major work still remains to restore waters that suffer from non-point source pollution. The Little Sac River from McDaniel Lake to Stockton Reservoir and the Sac River from Stockton Dam to Hwy J are listed as 305(b) impaired streams.

Section 303(d) of the Clean Water Act requires states to list waters not expected to meet established, state water quality standards even after application of conventional technology-based controls for which total maximum daily load (TMDL) studies have not yet been completed. The list is produced every four years by the MDNR and includes waters for which existing required pollution controls are not stringent enough to maintain state water quality standards. Examples of waters on this list include streams below coal or lead mining areas, streams or lakes with pesticide problems, rivers that have problems related to dams, and streams that were channelized long ago. The Little Sac River watershed is included in Missouri's 303(d) listings. Water quality problems listed as 303(d) impairments are fecal coliform suspected as originating from the Springfield Northwest Waste Water Treatment Plant, and agricultural/suburban non-point source nutrient pollution of Fellows and McDaniel lakes.

WQ 01

There are approximately 1,300 miles of impaired streams and 1,013 impaired lake acres found within the Sac River basin. Sources of biological impairment include damming, riparian degradation, channel alteration, urbanization, flow alteration, sedimentation, point source pollution, and non-point source pollution.

For more information, contact DNR's Water Pollution Control Program at 1-800-361-4827 or (573) 751-1300

# **Chemical Quality of Stream Flow**

The EPA index of watershed indicators report on ambient water quality monitoring of copper, nickel, zinc, chromium, phosphorus, pH, dissolved oxygen, and ammonia in the Sac River basin found that levels exceeded established criteria in less than 10 percent of the observations (EPA website 1999).

Water quality problems associated with increased urban development are an ongoing concern in the Little Sac portion of the Sac River basin. Population increases in the Springfield metropolitan area are the primary reason for increased nutrification and algal growth in the Little Sac watershed. Occasionally high phosphate, nitrate, and sulfate levels are likely due to localized agricultural practices, overflow from the northwest treatment plant, or leachate from the Springfield landfill (Sparks and Pavlowsky, 2000).

For detailed information, call Watershed Committee of the Ozarks at 417-866-1127.

### Contaminants, Fish Kills, and Health Advisories

Reports of pollution and fish kills have increased in recent years. This may be the result of increased pollution events, increased environmental awareness and activism, better monitoring by state and federal agencies, or a combination of these factors. Table 7 lists pollution investigations involving MDC from 1977 through 2000.

All fish in the Sac River basin are considered safe to eat in any amount (MDOH 1999).

#### **Water Use**

High utilization of groundwater in and around the Springfield metropolitan area has cased a cone of depression to form in the water table (Barnett et al 1985). This cone of depression will expand, may cause shallow wells to go dry, and increase pumping costs for groundwater users in the area. Groundwater yields from bedrock range from 2 to 40 gallons per minute per foot of drawdown (MDNR 1986). The quality of the groundwater ranges from good to excellent throughout the basin (MDNR 1986). Water use is highest in Greene County (Springfield) and second highest in Cedar County (Stockton Lake power generation) (MDNR 1986). There are four public water supply districts in the Sac River basin (MDNR 1986). In 1996, City Utilities of Springfield constructed a pipeline to pump water from Stockton Lake to Fellows Lake (Watershed Committee of the Ozarks 1999). The two public water supply surface water intakes in the basin are on Fellows Lake and McDaniel Lake (MDNR 1986). Water use in the Sac River basin in Missouri is about 10.9 trillion gallons per year. Public and domestic use accounts for 7.4 trillion gallons, industrial/commercial for 920 million gallons, and agriculture for 2.5 trillion gallons (Ducharme and Miller 1996). Table 8 and Figure 17 show the public water facilities in the Sac River basin.

#### **Point Source Pollution**

Table 7. Known information on fish kills in the Sac River basin.

Stream/Pond	County	Date	Cause	Number	Value\$	Area
S. Dry Sac River	Greene	7-31-77	Sewage	1,400		1 mile
<b>Limestone Creek</b>	Dade	6-30-78	Timber clearing/ soil erosion			
Horse Creek	Dade	4-26-78	WWTF effluent			
Little Sac River	Greene	11-30-78	Landfill seepage			
Coon Creek	St. Clair	4-7-78	Petroleum			
Giddings Pond	Dade	6-23-79	Unknown	9,255		12 acres
Grus Pond	St. Clair	12-3-79	Chlorine suspected	Unknown		0.3 acres
Asher Creek	Greene	8-24-79	Petroleum pipeline rupture	42,112	14,891.00*	5 miles
Mile Branch Trib	Polk	1-26-80	Petroleum			
Little Sac River	Greene	9-22-82	WWTF effluent			unknown
S. Dry Sac River	Greene	4-2-82	WWTF effluent	169	147.80	0.7 miles
Little Sac River	Greene	7-12-82	WWTF effluent 4,04		1,657.67	7.5 miles
Coon Creek Trib	St. Clair	8-19-82	Animal Manure	100	4.00	0.5 miles
McConnell Pond	Dade	8-25-81	Unknown	83		1.5 acres
Little Sac River	Greene	8-1-83	Oxygen depletion	108	56.62	0.1 miles
Little Sac River	Greene	10-18-83	WWTF effluent			1.0 miles
<b>Limestone Creek</b>	Dade	9-8-83	Unauthorized Channelization			0.5 miles
Sac River	Dade	1-9-84	Chemical spill			unknown
Sons Creek	Dade	2-21-84	Industrial effluent			unknown
Sons Creek	Dade	3-9-84	Uncontrolled			unknown
Sons Creek	Dade	4-11-84	Uncontrolled dumping			unknown
Sons Creek	Dade	7-11-85	Industrial effluent	0		
Turnback Creek	Dade	10-16-85	Low DO (natural)	1,192+		
Hunter Branch	Cedar	2-18-86	Industrial effluent	200	12.00	
Stockton Lake	Cedar	5-6-86	Bacteria	2,000		
Turnback Creek	Lawrence	7-20-86	Transportation spill	0	0	
Little Sac River	Polk	3-14-86	Human Waste	0	0	
Deere Creek	Polk	8-4-86	Transportation spill	0	0	
Kile Creek	Dade	5-3-87	Animal manure	1,364	833.68	
none	Dade	5-11-87	Transportation spill	0	0	

Stockton Lake	Dade	7-13-87	Bluegreen algae	unknown	unknown	
Little Sac Trib.	Greene	2-26-87	Garbage	0	0	
<b>Doling Branch</b>	Greene	5-11-87	Sewage	0	0	
N. Dry Sac Trib	Greene	7-27-87	Sewage	0	0	
Stahl Creek	Lawrence	7-20-87	Sewage	0	0	
Stahl Creek	Lawrence	8-11-87	Sewage	0	0	
Little Sac River	Greene	8-3-90	Sewage	4,071	705.74	
Stahl Creek	Lawrence	3-18-91				
Johnson Creek	Lawrence	8-17-91				
Slagle Creek Tributary	Polk	3-10-91	Winterkill	200		.25 mile
Kay Pond	Polk	6-26-91	Summerkill	unknown		.5 acre
Faucett Pond	Cedar	6-1-92	Summerkill	unknown		1 acre
Stockton Lake	Cedar	4-10-92	Disease	unknown		
McLanahan Pond	Dade	8-28-92	Summerkill	400		2 acres
Eft Pond	Dade	7-24-92	Summerkill	12		.5 acres
Bois D'Arc CA	Greene	7-7-92	Summerkill			.5
Milsap Pond	Greene	7-28-92	Summerkill			.25
<b>Boyce Pond</b>	Greene	10-7-92	Disease			
Bois D'Arc CA	Greene	7-7-92	Summerkill			1
Bois D'Arc CA	Greene	6-20-94	Parasites			1.5 acres
Chat Creek, tributary to	Lawrence	3-13-95	#2 Diesel fuel			
Palmer Pond	Vernon	3-20-95	28% Nitrogen fertilizer			
Jordan Creek	Greene	3-27-95	Milk			
Clear Creek, tributary to	Vernon	6-14-95	Diesel oil			
Chaney Branch of Horse Creek	Barton	8-30-95	Hog manure (likely FALSE report)			
Southern Hills Lake	Greene	9-22-95				
<b>Doling Park Lake</b>	Greene	9-28-95	Sewage (suspected)	60	18.60	
Clear Creek Spring	Greene	1-19-96	Petroleum			
Pomme de Terre Lake	Hickory	2-6-96		7,000	6,894.74	
Jordan Creek	Greene	2-13-96	Specific cause undetermined	2,198	343.11	

Jordan Creek	Greene	3-14-96				
Jordan Creek	Greene	3-14-96	Specific cause undetermined			
Clear Creek, tributary to	Vernon	9-11-96	Sewage			
Brush Creek	Polk	9-25-96	Sewage			
Valley Water Mill Lake	Greene	9-30-96	Low dissolved oxygen	68	28.18	
Burrell Park Lake (on Ward Branch)	Greene	4-21-97	Yellow Paint-like substance	56	50.56	
Ingram Mills/Shady Glenn Streets Retention pond	Greene	6-2-97	Low dissolved oxygen (suspected)	199	283.75	
Wilson Creek	Greene	6-23-97	Raw sewage	53,440	10,147.11	
<b>Christian Creek</b>	Vernon	7-23-97	Gasoline	14	1.96	
Brush Creek	Polk	8-11-97	Sewage			
Griesmers Quarry Pond	Greene	9-9-97	Low dissolved oxygen	100		
Wilson Creek	Greene	9-22-97	Low dissolved oxygen	215	22.54	
Monegaw Creek	St Clair	10-7-97	Poorly treated sewage			
Miller Branch	Vernon	3-25-98	Diesel fuel	12	1.20	
<b>Honey Creek</b>	Lawrence	4-1-98	Concrete			
Little Sac River & Ritter Spring Branch	Greene	4-22-98	Untreated sewage.			
Simpson's Lake	Lawrence	4-24-98	Unknown. Pesticide	32	57.31	
Pea Ridge Creek	Greene	11-18-98	Sewage			
Douglas Branch	Vernon	11-23-98	Hog Manure			
Spangler Pond/Dry Wood Creek	Vernon	6-2-99		12	1.20	
Jordan Creek	Greene	12-30-99	Unknown	2286	267.97	

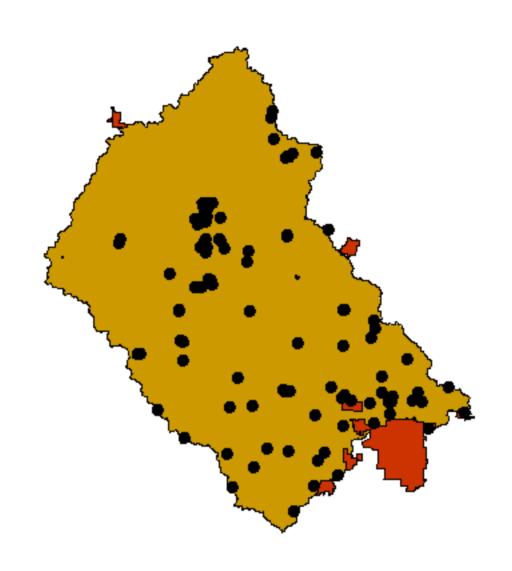
<sup>\* - \$18,500.00</sup> actual judgement amount.

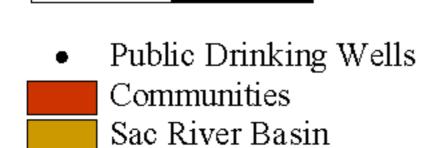
Table 8. Public water supply facilities in the Sac River basin (MDNR 1986).

Community	County	Type	Capacity
Jerico Springs	Cedar	Well	.25999 mgd
Stockton	Cedar	Well	.25999 mgd
<b>Umber View Heights</b>	Cedar	Well	< .25 mgd
Billings	Christian	Well	.25999 mgd
Arcola	Dade	Well	<.25 mgd
Dadeville	Dade	Well	< .25 mgd
Everton	Dade	Well	<.25 mgd
Greenfield	Dade	Well	.25999 mgd
Lockwood	Dade	Well	.25999 mgd
South Greenfield	Dade	Well	.25999 mgd
Ash Grove	Greene	Well	.25999 mgd
Republic	Greene	Well	.25999 mgd
Springfield	Greene	Reservoir	> 10 mgd
Strafford	Greene	Well	< .25 mgd
Walnut Grove	Greene	Well	.25999 mgd
Willard	Greene	Well	.25999 mgd
Halltown	Lawrence	Well	< .25 mgd
Miller	Lawrence	Well	.25999 mgd
Bolivar	Polk	Well	1.00 - 9.99 mgd
Fair Play	Polk	Well	.25999 mgd
Flemington	Polk	Well	< .25 mgd
Humansville	Polk	Well	.25999 mgd
Morrisville	Polk	Well	< .25 mgd
Pleasant Hope	Polk	Well	< .25 mgd
Collins	St. Clair	Well	< .25 mgd

Figure 17 Public Wells

Figure 17. Public drinking system wells in the Sac River basin







Several waste water treatment facilities (WWTF) in the basin have historically violated their discharge permits. As population increases are occurring these problems are likely to increase. Water quality concerns associated with point sources were listed in the Missouri Water Quality Basin Plan (MDNR 1996). The problems associated with point source discharges at this time included: problems meeting the permit limits for nickel and cadium at the Republic WWTF affecting 3 miles of unclassified stream; potential for instream toxicity of ammonia in the Little Sac River below Springfield's Northwest WWTF; 0.2 miles of an unclassified stream minimally impacted by two Greenfield WWTFs; dissolved oxygen depletion and discoloration problems in receiving streams from the Fair Play South WWTF; and dissolved oxygen depletion and discoloration from the Stockton WWTF caused a partial loss of beneficial use of Stockton Branch.

The Clean Water Act requires wastewater dischargers to have a permit establishing pollution limits, and specifying monitoring and reporting requirements. National Pollutant Discharge Elimination System (NPDES) permits regulate household and industrial wastes that are collected in sewers and treated at municipal wastewater treatment plants. These permits also regulate industrial point sources and concentrated animal feeding operations that discharge into other wastewater collection systems or that discharge directly into receiving waters. Table 9 lists NPDES permitted point source discharges in the Sac River basin.

The Toxic Release Inventory (TRI) is an EPA generated source of information about toxic chemicals that are being used, manufactured, treated, transported, or released into the environment from various sources. Table 10 lists toxic release inventory facilities in the Sac River basin.

Hazardous waste information is tracked by state and federal agencies as part of the Resource Conservation and Recovery Act (RCRA). EPA maintains this information in a database called the Resource Conservation and Recovery Information System (RCRIS). Table 11 lists various facilities in the Sac River basin that generate, transport, treat, or dispose of hazardous wastes that are monitored under RCRA.

Air emissions of pollutants are reported as part of the Aerometric Information Retrieval System (AIRS). The AIRS facility subsystem (AFS) contains information on compliance and emissions of facilities with air pollution point sources that are monitored by EPA and/or state regulatory agencies. Table 12 lists facilities with airborne pollutant emissions in the Sac River basin.

Years ago, many wastes were dumped on the ground, in rivers, or left out in the open. As a result, thousands of uncontrolled or abandoned hazardous waste sites were created. Some common hazardous waste sites include abandoned warehouses, manufacturing facilities, processing plants, and landfills. In response to growing concern over health and environmental risks posed by hazardous waste sites, Congress established the Superfund Program in 1980 to clean up these sites. The Superfund Program is administered by the EPA in cooperation with individual states throughout the United States. The Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) is the official repository for site and non-site specific Superfund data in support of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). It contains information on hazardous waste site assessment and remediation from 1983 to the present. Table 13 lists inactive superfund sites in the Sac River basin.

#### **Non-Point Source Pollution**

Table 9. Permitted point source discharges in the Sac River basin.

Facility <sup>1</sup>	Type Facility	<b>Design PE<sup>2</sup></b>	Receiving Stream	NPDES Permit
Fair Play South WWTF	1 Cell lagoon	376	Tributary of Barren Creek	0031305
Fair Play West WWTF	1 Cell lagoon	159	Tributary of Bear Creek	0043931
<b>Humansville WWTF</b>	1 Cell lagoon	2,650	Brush Creek	0025739
Lockwood WWTF	Trickling Filter	900	Horse Creek	0030473
	2 Cell Lagoon			
Stockton WWTF	3 Cell Lagoon	1,200	Stockton Branch	0055280
Stockton Lake Powerhouse	Extended Aeration	5	Sac River	0099244
Maple Hill Mobile Home Park	2 Cell Lagoon	172	Tributary of Bear Creek	0045691
Old Mill PUA	1 Cell Lagoon		Sac River	0060151
<b>Greenfield North WWTF</b>	1 Cell Lagoon	200	Tributary of Wetzel Creek	0055638
<b>Greenfield West WWTF</b>	2 Cell Lagoon	2,560	Wetzel Creek	0055590
Stockton PUA	1 Cell Lagoon		Stockton Lake	0060071
Orleans Trail PUA	1 Cell Lagoon		Stockton Lake	0059374
Orleans Trail PUA	Extended Aeration	100	Stockton Lake	0030287
American Resorts	Extended Aeration	72	Tributary to Stockton Lake	0093220
Hawker Point(N) PUA	1 Cell Lagoon		Stockton Lake	0060135
Hawker Point(S) PUA	1 Cell Lagoon		Stockton Lake	0060143
Ruark Bluff PUA	1 Cell Lagoon		Stockton Lake	0060089
Mutton Creek(S) PUA	1 Cell Lagoon		Stockton Lake	0060160
Mutton Creek(N) PUA	1 Cell Lagoon		Stockton Lake	0060178
<b>Mutton Creek Marina</b>	2 Cell Lagoon		Stockton Lake	0059382
Stockton State Park	1 Cell Lagoon	80	Stockton Lake	0095893
Mt. Carmel Estates	Extended Aeration	342	Stockton Lake	0035530
Cedar Ridge PUA	1 Cell Lagoon		Stockton Lake	0060101
Masters PUA	1 Cell Lagoon		Stockton Lake	0060119
Crabtree Cove PUA	1 Cell Lagoon		Stockton Lake	0060127
Ash Grove WWTF*			Sac River	MO0001750538
Litton Systems Inc.*				MOD007152903

MHTD I-44 Rest Area*	3 Cell Lagoons	Tributary of Johnson Creek	MO0001744044
Springfield NW WWTF*	Extended Aeration	Little Sac River	MOD985770288
Republic WWTF		Dry Branch	MO0022098
Billings WWTF		Turnback Creek	MO0042480
Alpine Village MHP	Extended Aeration	Tributary to Pond Creek	MO0052281
Jump Oil & Propane	Septic Tank	Coon Creek	MO0098191
Collins Waste Treatment and Col	1 Lagoon	Coon Creek	MO0103756
Springfield Sanitary Landfill		North Dry Sac River	MO0106658
Walnut Grove WWTF		Sugar Creek	MO0107174
Git-N-Go Store #86	Septic Tank	Tributary to Little Sac	MO0113123
Roadway Express		Tributary to South Dry Sac	MO0113476
Kerr-Mcgee Chemical		Tributary to Spring Branch	MO0117331
McDaniel Lake		Little Sac River	MO0117340
Willard Elementary WWTF	Septic Tank	Tributary to Rainer Branch	MO0117455
Flemington WWTF	3 Cell Lagoons	Rule Creek	MO0118982
Pleasant View Estate WWTF	Septic Tank	Stockton Lake	MO0119628
Good Samaritan Boys Ranch	Septic Tank	Tributary of North Dry Sac River	MO0123277
Cedar Ridge PUA*	1 Lagoon	Stockton Lake	MO0001742527

 $<sup>^{1}</sup>$  - WWTF = Wastewater Treatment Facility, PUA = Public Use Area

Source: MDNR (Vol 4)., \*EPA PCS(water dischargers) listing (SYW 1999)

 $<sup>^2</sup>$  - Human Population Equivalent, blank cells indicate a 1 time per year seasonal discharge of less than 250,000 gallons

Table 10. Toxic release inventory facilities in the Sac River basin.

Facility	Facility ID	Address	City
<b>Aarons Automotive Products</b>	MOD981509268	2600 N. Westgate	Springfield
Acme Structural Inc.	MOD985775527	2101 N. Packer Rd.	Springfield
Conoco Inc Mt. Vernon Prods.	MO0002376564	15138 Hwy. 96	Mt Vernon
<b>Explosives Energies Inc.</b>	MOD985774611	Route BB	Greenfield
Hiland Dairy Co.	MOD981707573	1133 E. Kearney	Springfield
Kerr McGee Chemical Corp.	MOD007129406	2800 W. High Street	Springfield
Lajet Inc.	MOD981719370	1547 E. Florida	Springfield
Litton Systems Inc.	MOD007152903	4811 W. Kearney	Springfield
Lorren Cook Co.	MOD981120595	2015 E. Dale	Springfield
Master Builders Inc.	MOD048245500	3045 W. Atlantic St.	Springfield
Master Mix Feeds	MOD057902546	1300 W. Locust	Springfield
Ozark Circuits Inc.	MOD107100356	933 W. Chase	Springfield
Ozarks Coca-Cola Btlg. Co.	MOD985774868	1777 N. Packer Rd.	Springfield
Pepsi Cola General Bottlers Inc.	MOD985774900	2200 E. Turner	Springfield
Purina Mills	MOD049572449	2726 W. Davidson St.	Springfield
Rainbow Coatings Corp.	MOD007126154	2029 N. Golden	Springfield
Ridewell Corporation	MOD985768936	Hwy 65 & F.R. 94	Springfield
Royal Oak Ents. Inc	000006747608	Off HW 23	Huntsville, AR
Springfield Railway Services	MOD175621044	1849 N. Park Ave.	Springfield
Stainless Fabrication Inc.	MO0000892166	4455 W. Kearney	Springfield
Superior Gearbox Co.	MOD081638314	W. Hwy 32	Stockton
Wilcorp Inds, Inc.	MOD175621044	304 S.W. Main	Billings
Zenith Electronics Corp.	MOD043941798	2500 E. Kearney	Springfield

Source: U.S. Environmental Protection Agency website (2000).

Table 11. Facilities that are involved with hazardous wastes in the Sac River basin.

Facility	Facility ID	Address	City
ABC Pictures Inc.	MOD981509268	1867 E. Florida	Springfield
Aarons Automotive Products	MOD981509268	2600 N. Westgate	Springfield
Ace Transmission Service & Supply	MO0000192823	2610 W. Kearney	Springfield
Acme Structural	MOD985775527	2101 N Packer Rd	Springfield
Advance Plating Inc.	MOD985797570	504 Hampton Street	Republic
Air Midwest Inc.	MOD063690234	5000 W. Kearney	Springfield
AT&T Long Lines	MOD980518492		Everton
Associated Wholesale	MOD006865935	3201 E. Division	Springfield
Barclay Enterprise Jiffy Lube	MOD985775899	850 E. Kearney	Springfield
Bass Pro Shops Inc.	MOD082130378	1935 S. Campbell	Springfield
Bathroom Magic of the Ozarks Inc	MOD067944983	1915 N. National	Springfield
Be Mac Transport Co. Inc.	MOD050719558	2854 E. Kearney Avenue	Springfield
Bristol Manufacturing	MOD985819374	2020 E. Dale	Springfield
C & P Truck Body Equipment Co	MOD030651962	1948 NW Bypass	Springfield
Catt	MOD981721004	2525 E. Kearney	Springfield
Central Soya of Springfield	MOD057902546	1300W. Locust	Springfield
City Utilities Material Yard	MOD000647198	1318 W. Division	Springfield
Classic Trailer Inc	MOD981724990	1625 NW Bypasss	Springfield
Commercial Plastics Co. Inc.	MO0000076000	3005 E. Hwy 60	Republic
Coose Trailers Manufacturing Inc.	MOD093807410	Route 2 Box 152 A	Lockwood
Dancey Collision Repair Inc.	MOD098271257	2615 E. Kearney	Springfield
Deer Lake Golf Course LLC	MO0000972216	5544 W. Chestnut	Springfield
Engines Plus Inc	MOD985770114	1824 NW Bypass	Springfield
Engines Plus Inc.	MOD981724222	3440 G W. Division	Springfield
Family Dry Cleaners	MOD082138298	426 N. Hwy 60	Republic
Fulbright Water Treatment Plant	MOD985772623	4100 N. Stagecoach	Springfield
GM Finishing	MOD985771906	1851 E. Florida	Springfield
General Tire SVC	MOD050708668	1835 N. Glenstone	Springfield
<b>Greene County Highway Dept</b>	MOD985768837	2065 N. Clifton	Springfield
Griffin Casket Co.	MOD985818749	101 N. Tower	Ash Grove
Handcrafted Hardwood Inc	MO0001005602	1545 NW Bypass	Springfield
Heavy Duty Rebuild Supply	MOD131572794	1943 E. Blaine	Springfield

Hendrick Diesel	MOD181786310	2643 E. Kearney	Springfield
Hiland Dairy Co.	MOD981707573	1133 E. Kearney	Springfield
Hill Plating Inc	MOD981719370	•	Springfield
Kerr McGee Chemical Corp.	MOD007129406	2800 W. High Street	Springfield
Kodiak Trailer Manufacturing	MO0000486456	Route 2 Box 191	Lockwood
Legendary-Autoworks & Detail	MO0000139188	2051-A E. Kearney	Springfield
Litton Systems Inc.	MOD007152903	4811 W. Kearney	Springfield
Lorren Cook Co.	MOD981120595	2015 E. Dale	Springfield
M D Pneumatics Inc.	MOD981715600	4840 W. Kearney	Springfield
Missouri Avcrad	MO7211829505	2501 Lester Jones	Springfield
Missouri Hwy & Transportation	MOD981726029	3025 E. Kearney	Springfield
Mono Manufacturing Co.	MOD007133945	Hwy 160 West	Springfield
National Oil Suppliers	MOD031141187	2345 W. Kearney	Springfield
Ole King Cole Dry Cleaners	MOD053705232	2901-I N. Glenstone	Springfield
Ozark Circuits	MOD107100356	933 W. Chase	Springfield
Ozark Kenworth	MOD053976221	3301 E. Kearney	Springfield
Ozarks Coca-Cola Btlg. Co.	MOD985774868	1777 N. Packer Rd.	Springfield
Palmerton & Parrish Inc	MOD985775550	2835 E. Division Unit K	Springfield
Peterbilt Body Shop	MOD985771831	2145 E. Kearney	Springfield
Peterbilt of Springfield Inc.	MOD981705734	2725 N. Eastgate	Springfield
Pinegar Chevrolet Inc.	MOD042860403	401 N. Hwy 60	Springfield
Polar Custom Trailers	MO0001837368	4825 E. Kearney	Springfield
Preferred Truck Service	MOD981705718	1950 E. Kearney	Springfield
Prime Inc.	MOD059199497	2740 N. Mayfair	Springfield
Radium Petroleum	MOD058936493	1914 E .Blaine	Springfield
Reckitt & Coleman	MOD052308442	4455 Mustard Way	Springfield
Reckitt & Coleman	000007614044	4443 Mustard Way	Springfield
Redi Strip of the Ozarks	MOD980686802	1828 Nias	Springfield
Republic Ford Inc.	MOD047941240	Hwy 60 South	Republic
Resource Services Inc.	MOD980850960	2457 E. Livingston	Springfield
Ridewell Corporation	MOD985768936	Hwy 65 & F.R. 94	Springfield
Sitton Motor Lines	MOD985822717	2320 N. Belcrest	Springfield
Sloan Body Shop	MOD985767979	Route 6	Springfield
South Central Container Inc	MO0001363217	1830 N. Nias	Springfield

Southwest Missouri Truck Center	MOD054085691	2527 N. Eastgate	Springfield
Sportsman Park Center	000007513328	2500B E. Kearney	Springfield
Springfield Coach Builders	MO0000861039	1725 N. Packer Rd	Springfield
Springfield Drivetrain Specialists	MOD985806884	2230 N. Packer Road	Springfield
Springfield Freightliner Sales	MOD062887484	3164 N. Glenstone	Springfield
Springfield Freightliner Sales	MO0001837236	3020 E. Division	Springfield
Springfield Fulbright Landfill	MOD980631139	Green County Road 188	Springfield
<b>Springfield Remanufacturing Center Corp.</b>	MOD000610634	4860 W. Maple Street	Springfield
Springfield Truck Auto	MOD985798784	4005 Kearney	Springfield
Springfield Truck Auto	MOD985771583	1830 W. Division	Springfield
SRC Automotive	MOD007126154	2029 N. Golden	Springfield
Sunbelt Environmental Services	MOD985813211	1820 N. Nias	Springfield
Sunbelt Industrial Services	MOD985768670	2701 N. National	Springfield
Sunbelt Industrial Services	MOD985792746	2032 E. Kearney	Springfield
Sunbelt Industrial Services	MOD985798966	1836 N. Barnes	Springfield
Superior Gearbox Co	MOD081638314	W. Hwy 32	Stockton
Superior Solvents and Chemicals	MOD981129075	2055 E. Blaine	Springfield
T&T Auto & Truck Cleanup	MOD058936493	1914 East Blaine	Springfield
T&T Auto & Truck Cleanup	MOD058936493	1914 East Blaine	Springfield
T&T Auto & Truck Cleanup	MO0000992552	1710 N. Barnes	Springfield
Thermoking of Springfield	MOD031145709	1353 NW Bypass	Springfield
Trailiner Corp	MO0000031443	2169 E. Blaine	Springfield
Trans State Airline	MOD985810688	5000 W. Kearney	Springfield
Trinity Rail Services PLT 387	MOD175621044	1849 N. Park Ave	Springfield
TSD Laboratories	MOD985796408	1612 N. Lexington	Springfield
Ulrich Marine Ctr	MOD985775121	1111 N. Hwy 60	Springfield
Vinyl Moldings Inc	MO0001363209	6302 W. Farm Rd 84	Springfield
Vinyl Moldings Inc	MOD055691018	1641 E. Florida St	Springfield
W K Missouri Associates LTD	MOD985819895	2610 N. Glenstone	Springfield
Walmart Stores Inc	MOD149962268	1923 E. Kearney	Springfield
Welches Overall Cleaning Co	MOD000639765	907 W. Chase St	Springfield
Western Lithotech	MOD030700678	2625 N. Neergard	Springfield
Whitener Trucking	MOD985799394	2160 E. Thoman	Springfield
Wilcorp Inds, Inc.	MOD175621044	304 S.W. Main	Billings

Yellow Freight Systems	MO0001837384	2121 E. Kearney St	Springfield
Zenith Electronics Corp.	MOD043941798	2500 E. Kearney	Springfield

Source: U.S. Environmental Protection Agency website (2000).

Table 12. Facilities with airborne pollutant emissions in the Sac River basin.

Facility	Facility ID	Address	City
<b>Aarons Automotive Products Inc</b>	MOD981509268	2600 North Westgate	Springfield
Acme Structural Inc	MOD985775527	2101 North Packer	Springfield
Advanced Plating Co Inc	MOD985797570	504 S. Hampton	Springfield
Allen Quarries	MOD007448459	Allen Quarries Inc.	Lockwood
Allen Quarries	MOD007448459	5 mi. SE off Hwy 160	Lockwood
<b>Associated Wholesale Grocers</b>	MOD006865935	3201 E. Davidson	Springfield
Bailey Quarries	MOD985812759	Hwy Z	Stockton
Bailey Quarries	MOD147983605	Chesapeake Quarry	Chesapeake
Bass Pro Sportsman's Park	MOD043941798	2500 E. Kearney	Springfield
Bristol Manufacturing	MOD985819374	2020 E. Dale	Springfield
Calvert Manufacturing Co.	MO0001563675	700 W. Chase	Springfield
Conco Quarry Co.	MOD980742282	Hwy 160	Willard
<b>Consolidated Nutrition, LC</b>	MOD057902546	1300 W. Locust	Springfield
<b>Explosives Energies INC</b>	MOD985774611	Route Bb	Greenfield
<b>Greenfield Concrete Product Inc.</b>	MOD985813922	Hwy 160	Greenfield
<b>Griffon Casket CO</b>	MOD985818749	105 N. Tower	Ash Grove
<b>Hammons Products Co.</b>	MOD985814961	217 Hammons Drive	Stockton
<b>Holiday Inn Conoco</b>	MO0001563741	2650 Colenstone	Springfield
Kerr McGee Chemical Corp.	MOD007129406	2800 W. High Street	Springfield
Killingsworth Mill	000007210064		Willard
<b>Koch Materials Company</b>	MOT300011061	3156 E. Division	Springfield
Leo Journagan Const. Co. Inc.	MO0001478437	Kearney & Lecompte Roads	Springfield
Litton Systems Inc.	MOD007152903	4811 W. Kearney	Springfield
Master Tune Inc.	MO0001538826	2317 N. Glenstone	Springfield
Masters Jackson Asphalt	MOD134955392	Hwy 160	Willard
MFA Inc., Bulk Plant	MO0001562859	P.O. Box 334	Lockwood
Ozarks Circuits Inc	MOD107100356	933 W. Chase	Springfield
<b>Pennington Seed Inc.</b>	MO0001562594	Hwy 160	Greenfield
Phenix Rock	000007209242	Phenix	Walnut Grove
R&R Quarry	000007209948		Fairplay
Ralston Purina	MOD049572449	2726 W. Division	Springfield
Razorback Pipeline	MO0001564830	Hwy 96	Miller
Reckitt & Coleman	MOD052308442	4455 Mustard Way	Springfield

Rich Mix Products Inc	MOD048245500	3045 W. Atlantic	Springfield	
Springfield Railway Services	MOD175621044	1849 N. Park	Springfield	
Stewart-Nattinger	MOD007133606	1650 E. Atlantic	Springfield	
Superior Carbon Inc.	MO0001563634	Hwy 123 & F.R. 51	Walnut Grove	
Taylor Quarries	MO0001562792	Route 3	Lockwood	
Viles and Sons Paving	MOD985776657	Route 1 Box 103	Brighton	
Willard Block Inc.	MO0001563667	P.O. Box 68	Willard	
Williams Pipeline Co	MO0001478619	Springfield Terminal	Springfield	

Source: U.S. Environmental Protection Agency website (2000).

Table 13. Inactive superfund sites found in the Sac River basin.

Name	Facility ID	Address	Town		
Kerr McGee Chemical Corp.	MOD007129406	2800 W. High Street	Springfield		
<b>Resource Services Inc.</b>	MOD980850960	2457 E. Livingston	Springfield		
<b>Shelton Property</b>	MO0001276930	2243 W. Farm Road	Springfield		
Zenith Electronics Corp.	MOD043941798	2500 E. Kearney	Springfield		

Source: U.S. Environmental Protection Agency website (2000).

#### Concentrated Animal Feeding Operations

Total effect from livestock in the basin was estimated to be 3,850,000 population equivalency (MDNR 1985). Animal feeding operations are starting to increase throughout the basin and corporate hog feeding operations are increasing north and west of Stockton Lake (Kevin Hess, MDNR, pers. comm.). Livestock is the most significant source of non-point pollution in the Sac River basin (MDNR 1996). Missouri as a state ranks second in the U.S. in the number of cattle operations and fifth in total number of cattle (NASS 2000). Lawrence County is the number one county in Missouri for cattle and calf population, and Polk County is the number one hay producing county in Missouri (MASS 2000) and also ranks very high in cattle and calves. Both of these counties lie partly within the Sac River basin. The basin as a whole is one of the top cattle and hay producing areas in Missouri. Pastured cattle and fertilization for hay production and subsequent nutrient runoff may contribute to the nutrification of watershed streams.

Concentrated animal feeding operations (CAFO) that have more than 1,000 animal units in Missouri are regulated by MDNR. MDNR CAFO regulations require (based on the number of animal units) a specified area of vegetated land be available and used for the spreading of waste. If enough land is not available, the waste must be hauled and spread elsewhere, sold, or contained in closed lagoons. Land application of animal waste has added to soil productivity and improved pasture and hay production. These elements led to an unquantified increase in land clearing and cattle production in the Elk River basin of southwest Missouri (G. Parsons and V. Kugler, MDNR, pers. com.). A similar relationship probably exists in the Sac River basin. It is thought that some CAFO operators, who land apply dry waste, may over-apply the manure. Phosphorus contamination of streams in the watershed is inevitable if wastes are over-applied. In recent years, the number of CAFOs (primarily hog operations) have increased in the northwest portion of the watershed. Table 14 and Figure 18 show the CAFOs found in the Sac River watershed.

#### **Erosion** -

Watershed land use was listed as approximately 50% row crops, pasture, and hayfield and 50% forest from 1985 through 1995 (MDNR 1985; MDNR 1996). Land in cultivation and pasture production has probably increased throughout the watershed as the number of CAFOs have increased.

Sheet and rill erosion on tilled and pasture lands is 2.5-5 tons/acre/year. Sheet and rill erosion on non-grazed forest is less than 0.25 tons/acre/year. Gully erosion is slight, with less than 0.15 tons/acre/year. These figures are low and agricultural erosion is not considered a basin-wide problem. Sediment yield by streams in the Sac River basin is 0.3--1.0 tons/acre/year, primarily from sheet and rill erosion (Anderson 1980). Helicopter video taken in 2000 revealed localized streambank erosion problems throughout the watershed.

#### Urbanization -

Water quality problems associated with increased urban development are an ongoing concern in the Little Sac River sub-basin (MDNR 1985; MDNR 1996). Little Sac River headwaters originate in the Springfield area. Springfield is the fastest growing metro area in the state. Including the urbanized area outside the city limits, the population figure is 240,500. Population in the greater Springfield area (40 mile radius) is 476,574 (U.S. Census Bureau 2000). Due to the weathering of the limestone and karst features in the Springfield area, urban runoff is a threat to groundwater. Increasing algae and nutrients in local reservoirs are the suspected cause of odor and taste problems in the drinking water supply (MDNR

1996). The abandoned Fullbright and Sac River landfills are in close proximity to the Little Sac River and have leached low levels of chemicals into the local aquifer (MDNR 1996). During the building of Springfield's northwest treatment plant, a leachate interception drain was constructed to stop the leaching of toxic metals and organic compounds into the Little Sac River. Today, the abandoned landfills are not thought to exert an environmental impact on the river (MDNR 1996).

# Mining -

Little information on gravel mining (including removal of gravel from streambeds) is known for the Sac River basin. There is one permitted gravel mining operation on Limestone Creek. There are many small localized areas where it appears landowners have removed gravel from or re-arranged gravel bars to use on farm roads and/or to prevent bank erosion. Another type of rock mining that is significant in the Sac River basin is limestone quarrying. Coal mining affects the Horse and Cedar creek drainages with the potential for acid drainage to reduce water quality. To date the effects have not been significant. (MDNR 1996). In the past, mining of lead, zinc, and iron was conducted in the Sac River basin. Most of this mining activity has ceased, but old mine shafts and mine tailings can be found and may create water quality problems with leaching of materials or by providing avenues for mixing of surface waters with groundwater. Figure 19 shows the locations of past and present mining operations of the Sac River Basin. Table 15 contains the known information about non-point pollution in the Sac River basin. Known information on gravel, limestone, and mineral mining in the Sac River basin is presented in Appendix B.

Table 14. Permitted concentrated animal feeding operations of the Sac River basin

Operator	Facility ID	County	Animal Type	Animal Units	Class	T	R	S
WILLIAM CURTSINGER	LA5104519	BARTON	HOGS	300-999	II	32	29	14
MURPHY FAMILY FARMS	MOG010134	BARTON	HOGS	1000-2999	IC	33	30	14
DAN PAYNE	LA5104321	BARTON	HOGS	<299	NP	33	29	26
BOBBY SELTZ	LA5103942	BARTON	AW <sup>1</sup>	300-999	II	33	29	3
JOANNA SMITH	LA5104194	BARTON	AW	300-999	II			
LARRY STEWART	LA5104291	BARTON	AW	<299	NP	32	29	2
GLENN AND MARY ARLINT	LA5104531	CEDAR	HOGS	<299	NP	33	28	6
ARCHIE BRACKENRIDGE	LA5104445	CEDAR	HOGS	<299	NP	35	28	1
SHEILA BRACKENRIDGE	LA5104575	CEDAR	HOGS	<299	NP	35	28	1
RICHARD & BETTY BRASHER	LA5104525	CEDAR	HOGS	<299	NP	34	29	25
DAVID JANES	LA5104334	CEDAR	AW	<299	NP	35	28	10
KEN KOENIG	LA5104523	CEDAR	HOGS	<299	NP	34	28	32
TIM MOORE	LA5104566	CEDAR	HOGS	<299	NP	33	28	21
RICELAND & CATTLE CO	LA5104211	CEDAR	AW	300-999	II	33	29	24
JAMES VINYARD	LA5104212	CEDAR	HOGS	<299	NP			
LESTER WEAVER	LA5104270	CEDAR	AW	<299	NP	35	27	3
BRUCE BARTLETT	LA5104333	DADE	AW	<299	NP	31	28	10
MISSOURI SOW CENTER INC.	LA5104594	DADE	HOGS	300-999	II	33	28	34
TIM AND TRACY SMITH	LA5104495	DADE	TURKEY	<299	NP	30	25	33
DOROTHY & ED SPAIN	MOG010328	DADE	TURKEY	1000-2999	IC	30	27	18
DOROTHY & ED SPAIN	LA5103976	DADE	AW	300-999	II			
MELVIN BACKS	LA5104460	DADE	AW	<299	NP	30	28	13
TOM WILKINS	LA5103836	DADE	AW	<299	NP	30	26	2

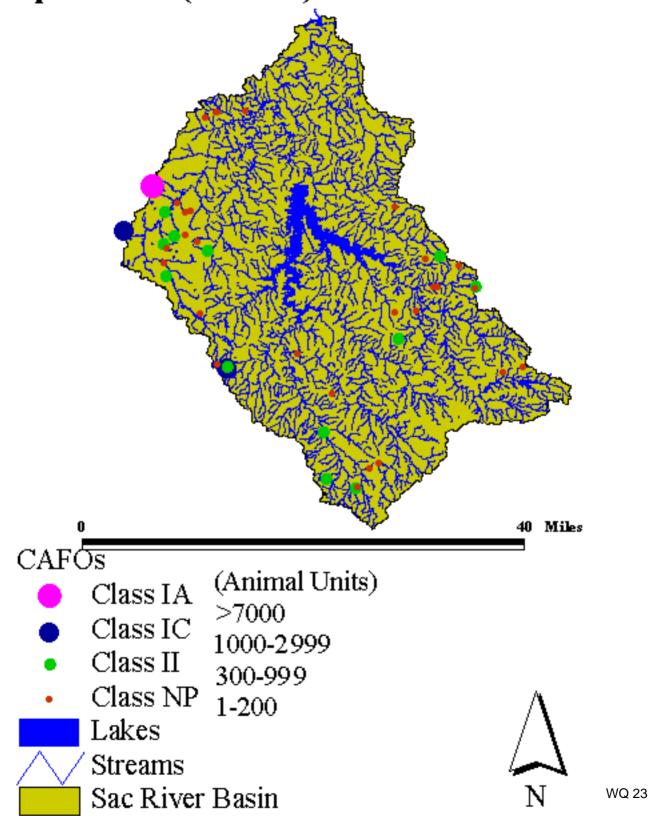
	LA5103855	GREENE	AW	<299	NP	30	21	8
DENNIS ESCH	LA5103807	GREENE	AW	300-999	II	31	24	25
DESSA HUBACH	LA5103799	GREENE	AW	<299	NP	28	24	7
GARY LEWIS	LA5104134	GREENE	AW	<299	NP	30	21	11
BOB SIFFERMAN	LA5100705	GREENE	AW	<299	NP			
RICK BEARD	LA5104498	LAWRENCE	TURKEY	300-999	II	28	25	20
JEFFERY SCOTT DENNEY	LA5104405	LAWRENCE	TURKEY	300-999	II	28	25	25
JOHN LUNDY	LA5104403	LAWRENCE	AW	300-999	II	29	25	19
DONNA WEATHERLY	LA5103791	LAWRENCE	AW	<299	NP	28	25	25
FRANK ARTZ	LA5103714	POLK	AW	<299	NP	31	23	5
BERNARD FRANCKA	LA5104042	POLK	AW	300-999	II			
DARRELL FRANCKA	LA5104499	POLK	DAIRY	300-999	II	32	22	15
DARRELL FRANCKA	LA5103719	POLK	AW	<299	NP	32	22	15
WILLIAM FRANCKA	LA5103990	POLK	AW	<299	NP	33	22	32
DOUG HOSMAN	LA5104198	POLK	AW	<299	NP	31	24	2
FRED LETTERMAN	LA5104411	POLK	DM <sup>2</sup>	<299	NP	32	23	14
MIKE PRESLEY	LA5104489	POLK	DAIRY	<299	NP	32	23	15
BILL TAYLOR	LA5104186	POLK	AW	<299	NP	33	23	33
TED ZEUGIN	LA5104044	POLK	AW	<299	NP	34	24	26
	MO0118729	VERNON	HOGS	> 7000	IA	34	29	

Source: Dan East, MDNR, pers. com.

1 - AW = Misc (Animal Waste)

2 - DM = Dairy or Cattle

Figure 18. Concentrated Animal Feeding Operations (CAFOs) of the Sac River basin.



# Figure 19. Mining operations of the Sac River basin

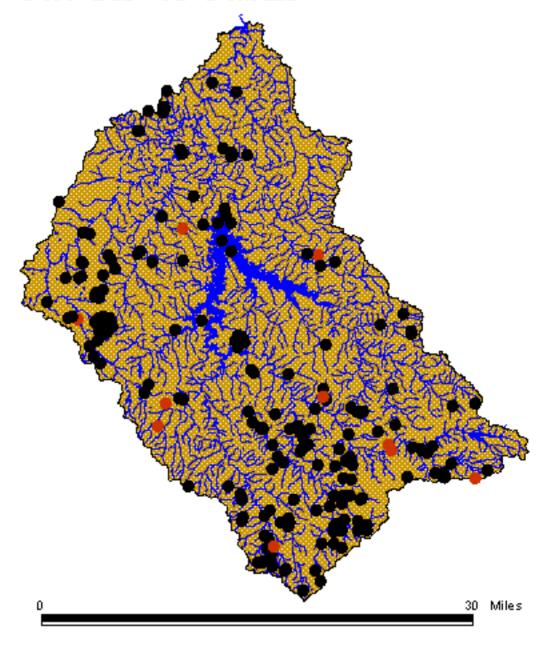






Table 15. Known information about non-point source pollution in the Sac River basin.

Name	Origin	Type of Pollution	of Pollution   County   St		Location		
		(primary)			T - R - Sec.		
Turner Area	Mining	Acid Drainage	Barton	Patton Branch	33-29-26		
Beydler Area	Mining	Acid Drainage	Cedar	Horse Creek Tributary	33-29-13		
Jack Smith Area	Mining	Acid Drainage	Cedar	Cedar Creek Tributary	33-27-6		
Gilbert Crain Area	Mining	Sediment and Acid Drainage	Cedar	Bear Creek Tributary	33-28-9		
Godfrey Drift Area	Mining	Gob	Cedar	Bear Creek Tributary	33-28-9		
Taylor Area	Mining	Acid Drainage	Cedar	Patton Branch	33-29-24		
Thomas Area	Mining	Coal Mining Spoil	Cedar	Cedar Creek Tributary	33-28-15		
Chaney Branch Area	Mining	Acid Drainage	Dade	Chaney Branch	33-28-32 32-28-6		
Hime Area	Mining	Acid Drainage	Dade	Patton Branch	33-29-25		
Milford Area	Mining	Coal Mining Spoil and Acid Drainage	Dade	Painter Branch	32-29-6		
Stump Area	Mining	Coal Mining Spoil and Acid Drainage	Dade	Big George Branch	32-28-17		
Valley Area	Mining	Coal Mining Spoil and Acid Drainage	Dade	Horse Creek Tributary	32-28-29		
Fulbright Landfill	Waste Disposal	Leachate	Greene	Pea Ridge Creek and South Dry Sac River	30-22-35/36		
Murray Landfill	Waste Disposal	Leachate	Greene	Little Sac River	30-22-34		

Source: MDNR (1996)